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13. ABSTRACT (Maximum 200 words)  This Performance Oriented Packaging (POP) test was conducted to ascertain whether the Shipping and Storage Container for Mk 125 Mod 2 RATO Rocket Motor meets the Packing Group II requirements specified by the United Nations Recommendation on the Transportation of Dangerous Goods Document, ST/SG/AC.10/1, Revision 6, Chapters 4 and 9 and the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178, dated 1 October 1991. The packaged commodity used for the test was a simulated load of sand weighing 10 kg (22 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in product and/or packaging, 1 kg (2 pounds) were added. Gross weight of the loaded container was 16 kg (35 pounds). The test results indicate that the container has conformed to the POP requirements.					
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**PERFORMANCE ORIENTED PACKAGING TESTING  
OF  
CONTAINER, SHIPPING AND STORAGE,  
FOR ROCKET MOTOR, RATO, MK 125 MOD 2  
FOR PACKING GROUP II SOLID HAZARDOUS MATERIALS**

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**Sponsoring Organization:**  
**Naval Surface Warfare Center**  
**Indian Head Division (Code 5710-T)**  
**Indian Head, MD 20640-5035**

## INTRODUCTION

This Performance Oriented Packaging (POP) test was performed to ascertain whether the Shipping and Storage Container for Mk 125 Mod 2 RATO Rocket Motor (Packing Group II) meets the requirements specified by the United Nations Recommendation on the Transportation of Dangerous Goods Document, ST/SG/AC.10/1, Revision 6, Chapters 4 and 9 and the Code of Federal Regulations, Title 49 CFR, Parts 107 through 178, dated 1 October 1991. The packaged commodity used for the test was a simulated load of sand weighing 10 kg (22 pounds). This represents the current maximum commodity weight. To compensate for future growth variations in product and/or packaging, 1 kg (2 pounds) were added. Gross weight of the loaded container was 16 kg (35 pounds). The containers were identified as #1, #2, and #3.

## TESTS PERFORMED

### 1. Base Level Vibration Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.608. Containers #1, #2, and #3 were placed on a repetitive shock platform which has a vertical linear motion of 1-inch double amplitude. Movement of the containers were restricted during vibration in all but the vertical direction. The frequency of the platform was increased until the containers left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour.

### 2. Stacking Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.606. Containers #1, #2, and #3 were used for this test. Each container was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a minimum height of 3 meters (including the test container). A weight of 47.89 kg (105.6 pounds) was stacked on each test container. The test was performed for 24 hours. The weight was then removed and the containers examined.

### 3. Drop Test

This test was performed in accordance with Title 49 CFR, Part 178, Subpart M, Sec. 178.603. Six drops were performed from a height of 1.2 meters (4 feet) in the following orientations (three drops for each orientation):

- a. Horizontally using container #1, #2, and #3.
- b. Diagonally on the edge between the cover assembly and the top ring of the container using container #1, #2, and #3.

## **PASS/FAIL**

### **1. Base Level Vibration Test**

The criteria for passing the base level vibration test is outlined in Title 49 CFR, Sec. 178.608(c): No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength.

### **2. Stacking Test**

The criteria for passing the stacking test is outlined in Title 49 CFR, Sec. 178.606(d): No test sample may show any deterioration which could adversely affect transportation safety or any distortion likely to reduce its strength, cause instability in stacks of packages, or cause damage to inner packagings likely to reduce safety in transportation.

### **3. Drop Test**

The criteria for passing the drop test is outlined in Title 49 CFR, Sec. 178.603(f): A package is considered to successfully pass the drop tests if for each sample tested, no rupture occurs which would permit spillage of loose explosive substances or articles from the outer packaging.

## **TEST RESULTS**

### **1. Base Level Vibration Test**

Satisfactory.

### **2. Stacking Test**

Satisfactory.

### **3. Drop Test**

Satisfactory.

## **DISCUSSION**

### **1. Base Level Vibration Test**

The input vibration frequency was 4.0 Hz. Immediately after the vibration test was completed, each container was removed from the platform, turned on its side and inspected. No unfavorable distortion or deterioration was observed.

**2. Stacking Test**

Each container was inspected after the 24-hour period was over. No unfavorable distortion or deterioration was observed.

**3. Drop Test**

After each drop, the containers were inspected. The contents were completely retained by the container.

**REFERENCE MATERIAL**

A. United Nation's "Recommendation on the Transportation of Dangerous Goods," ST/SG/AC.10/1, Revision 6.

B. Code of Federal Regulations, Title 49 CFR, Parts 107-178.

C. Bureau of Explosives Tariff No. BOE 6000K Hazardous Materials Regulations of the Department of Transportation by Air, Rail, Highway, Water including Specifications for Shipping Containers.

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## TEST DATA SHEET

## POP MARKING:

UN 1A2/Y16/S/\*\*/USA/DOD/NAD

\*\*YEAR LAST PACKED OR MANUFACTURED

## DATA SHEET:

Container: Shipping and Storage Container for Mk 125 Mod 2 RATO Rocket Motor

Type: 1A2

Container P/N or NSN:  
To Be Determined

Specification Number: DL 1560AS215

Material: Steel

Gross Weight:  
16 kg (35 pounds)Dimensions:  
8.50" Dia x 30.25" HClosure (Method/Type):  
Locking RingTare Weight:  
5 kg (11 pounds)

Additional Description: Drum, MS24347

## PRODUCT:

Name: See table 1

NSN(s): See table 1

United Nations Number: See table 1

United Nations Packing Group: II

Physical State (Solid, Liquid, or Gas): Solid

Vapor Pressure (Liquids Only): N/A

At 50 °C: N/A

At 55 °C: N/A

Consistency/Viscosity: N/A

Density/Specific Gravity: N/A

Amount Per Container:

Flash Point: N/A

Net Weight: See table 1

## TEST PRODUCT:

Name: Sand

Physical State: Solid

Consistency: N/A

Density/Specific Gravity: N/A

Test Pressure (Liquids Only): N/A

Amount Per Container: N/A

Net Weight: 11 kg (24 pounds)

Additional Description:

The net weight includes the current maximum product weight plus an additional 1 kg (2 pounds).

**TABLE 1**  
**Products Approved for Shipping in the**  
**Shipping and Storage Container**  
**for Mk 125 Mod 2 RATO Rocket Motor**

NALC/ DODIC	NSN	Product Nomenclature	Packing Drawing Number	Haz Class/Div	UN Number	Units/ Cntr	Total Net Weight (lb)	Total Gross Weight (lb)
TBD	TBD	Mk 125 Mod 2 Rocket Motor	DL 1560AS215	3	0186	1	22	33

TBD = To Be Determined